

# Implications of Aquaculture for Wild Fisheries: The Case of Alaska Wild Salmon

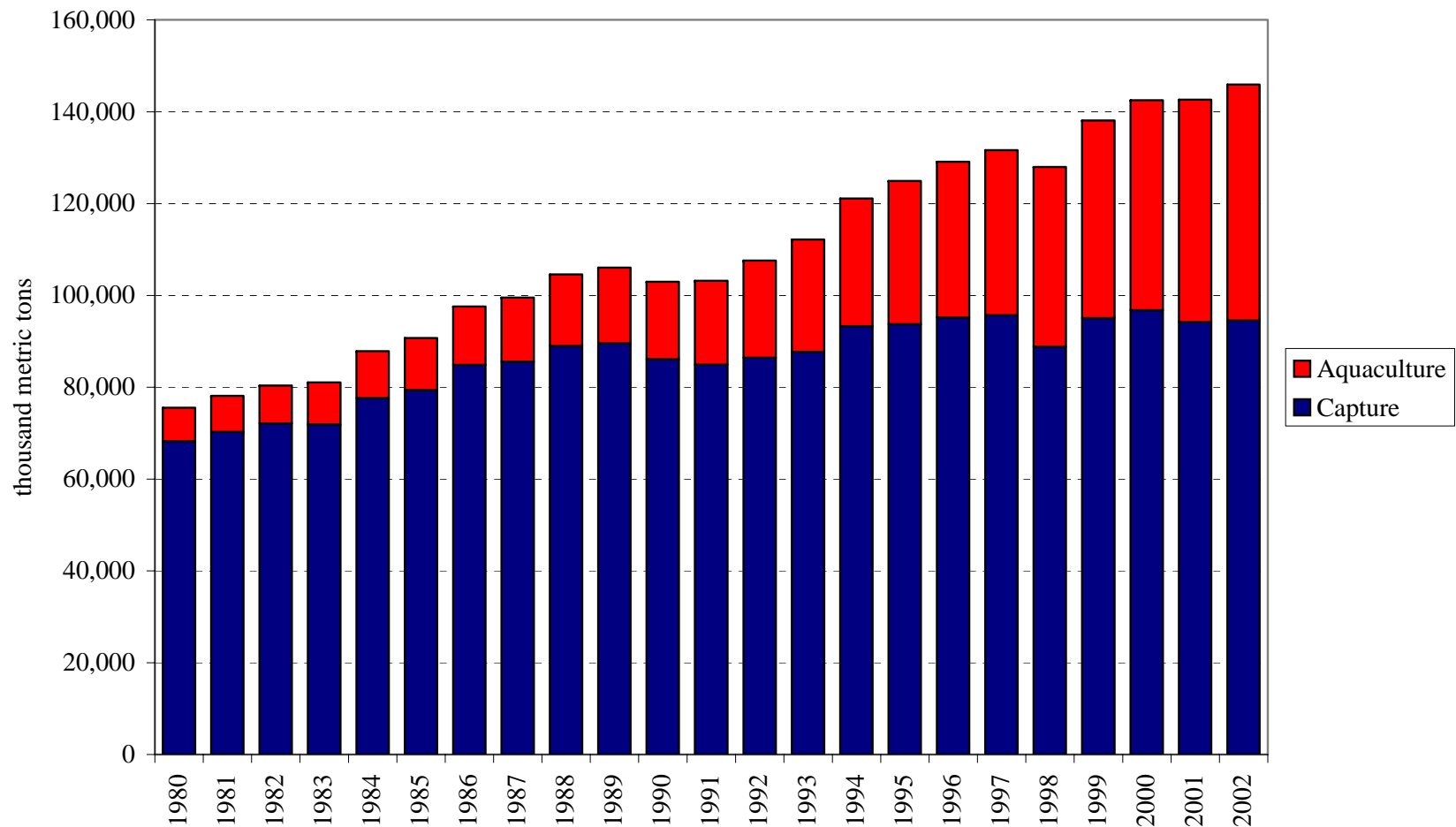
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University of Alaska Anchorage

*Presented at the  
National Marine Fisheries Service  
Silver Spring, Maryland  
March 5, 2008*



An aquaculture revolution is happening in the world seafood industry.  
Aquaculture accounts for an ever-growing share of world seafood production.

**Total World Fish Production**



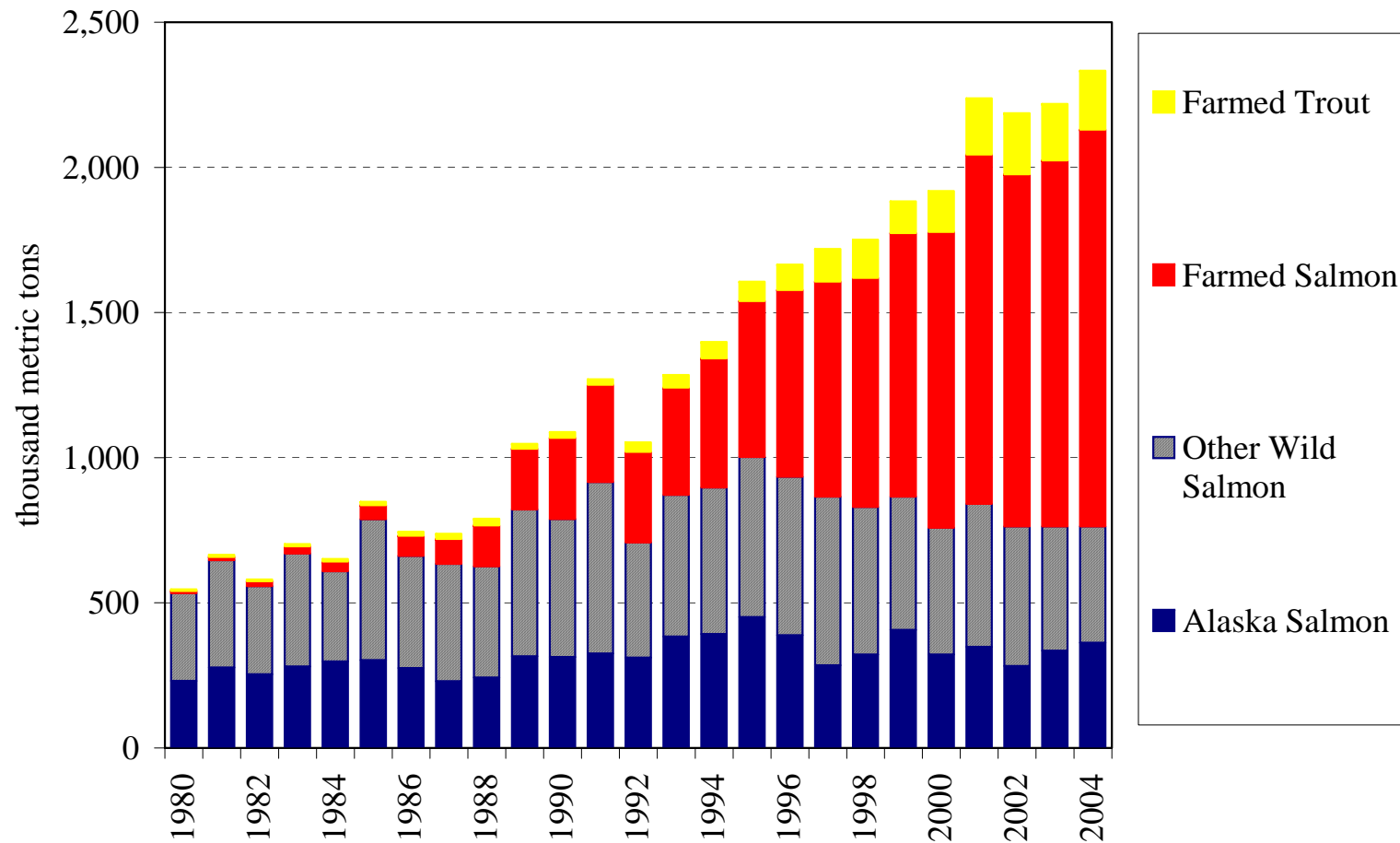
Source: FAO Fishstat+ database



One of the most important questions facing wild fisheries is how they will be affected by the development of aquaculture.

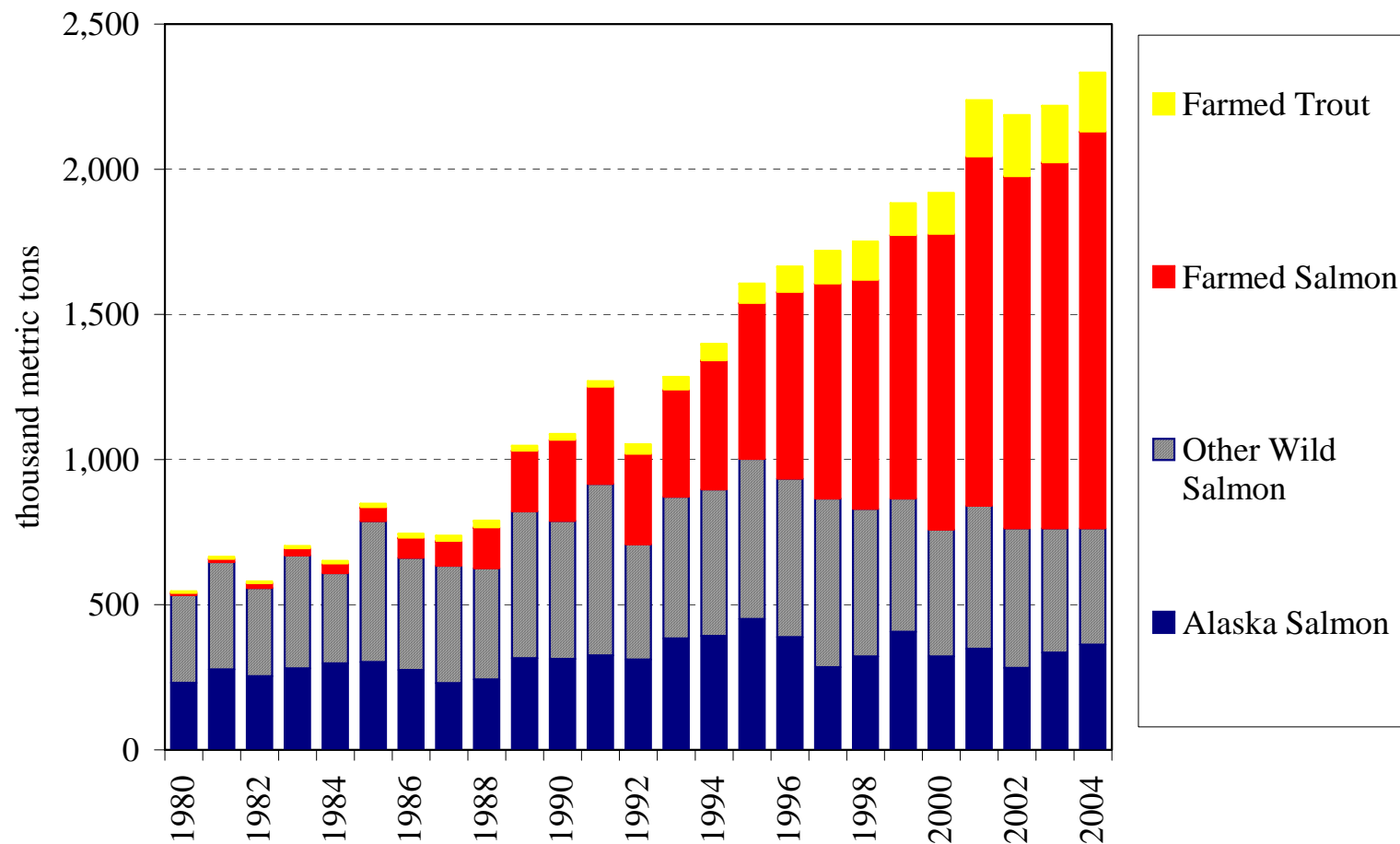
Salmon is one of the species for which the growth in aquaculture production has been most dramatic. Between 1980 and 2004, farmed salmon's share of world salmon supply grew from 2% to 65% of world salmon supply.

**World Salmon and Trout Supply, 1980-2004**



Alaska is the world's largest producer of wild salmon. Between 1980 and 2004, as farmed production grew, Alaska wild salmon's share of world supply fell from 42% to 15%.

**World Salmon and Trout Supply, 1980-2004**



The effects of salmon farming on the Alaska wild salmon industry provides insights into the question of how aquaculture may affect wild fisheries.

How has salmon farming affected the Alaska wild salmon industry?

## POPULAR / GREEN / ALASKAN PERSPECTIVE:

Unfairly subsidized and inferior farmed salmon harmed the environment and wild stocks in producing nations, and flooded world markets, depressing wild salmon prices and significantly harming Alaska fishermen and fishing communities.





How has salmon farming affected the Alaska wild salmon industry?

### AN ECONOMIC PERSPECTIVE:

Salmon farming exposed wild salmon's “natural” monopoly to competition, benefiting consumers by expanding availability, lowering prices, spurring innovation and market development, and leading to a more efficient wild salmon industry more focused on meeting market demands.





Some brief facts about the Alaska salmon industry



## CAUTION

The Alaska salmon industry is very diverse.

Beware of generalizations about:

“salmon”

“salmon prices”

“salmon markets

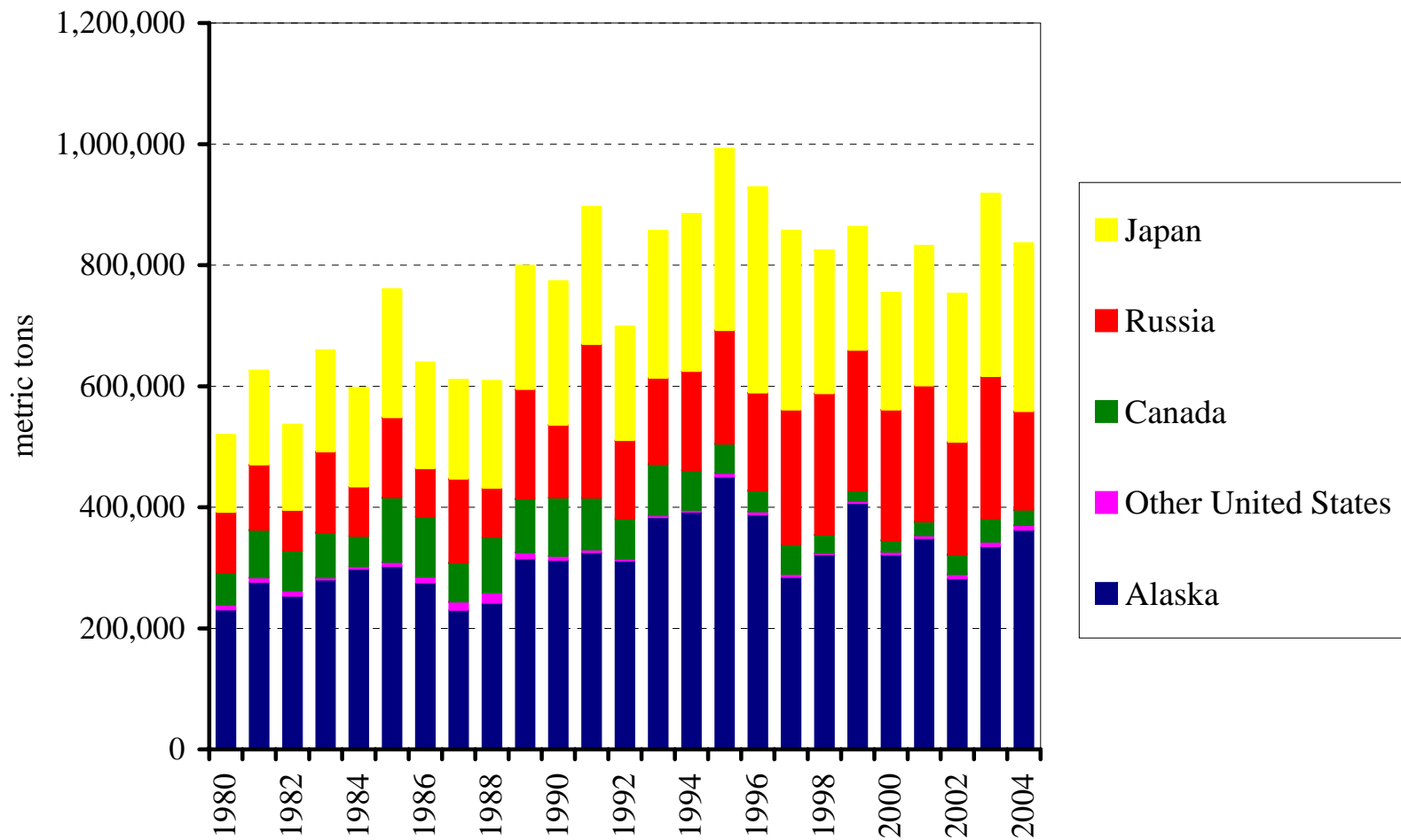
“salmon consumers”

“the salmon industry”

“effects of salmon farming on the wild salmon industry”

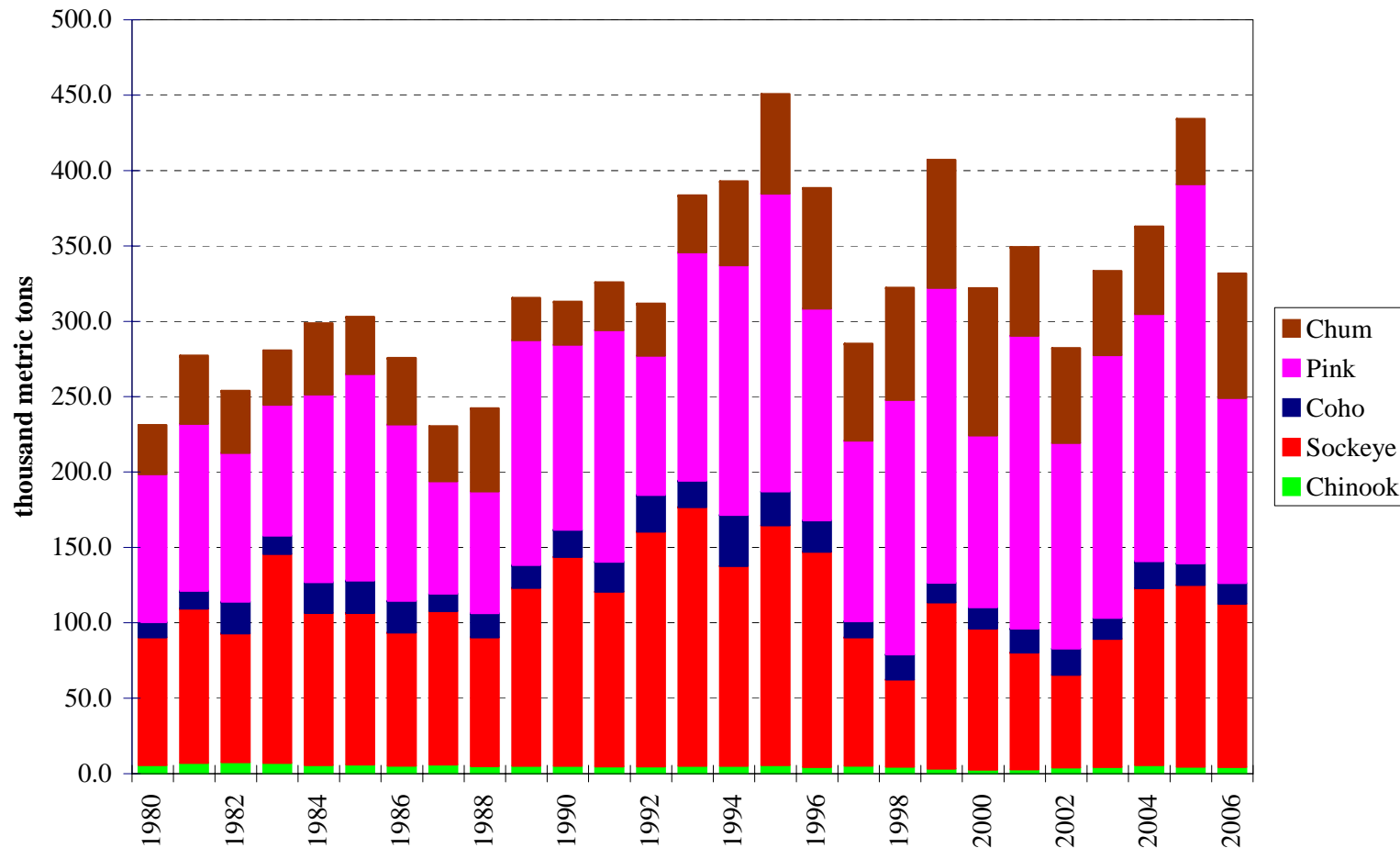
Alaska is the world's largest wild salmon producer (ahead of Japan, Russia, and Canada).

**World Wild Salmon Supply, by Country**



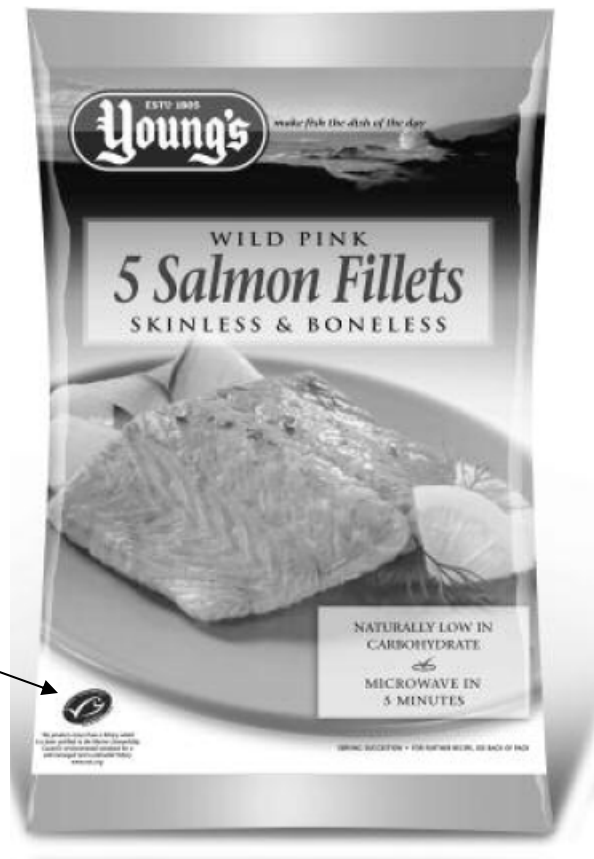
In recent years Alaska salmon harvests have averaged about 350 thousand metric tons. Five species of salmon are harvested. The most important species are sockeye, pink and chum salmon.

**Alaska Salmon Harvest Volume**



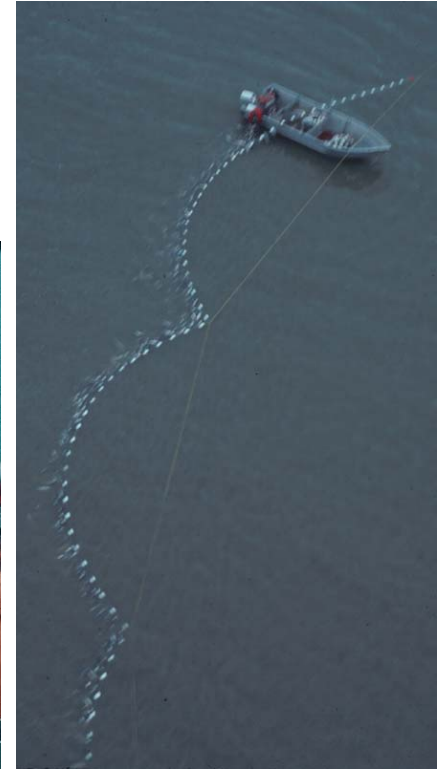
Source: 1980-2005: CFEC; 2006: ADFG Preliminary Estimates

Alaska wild salmon is certified as sustainable by the Marine Stewardship Council (MSC).



Alaska salmon are harvested by small boats using four major types of fishing gear. About 20,000 fishermen work seasonally in salmon fishing.

*Set gill net*



*Drift gill net*



*Seine*



*Troll*

*Troll fishing picture source: Downloaded February 3, 2005 from [www.primeseafood.com/salmon.html](http://www.primeseafood.com/salmon.html). Picture originally courtesy of Seafood Producers Cooperative.*



Alaska salmon are harvested in 27 different limited entry fisheries which differ widely in value, number of permit holders, average earnings and average permit value.

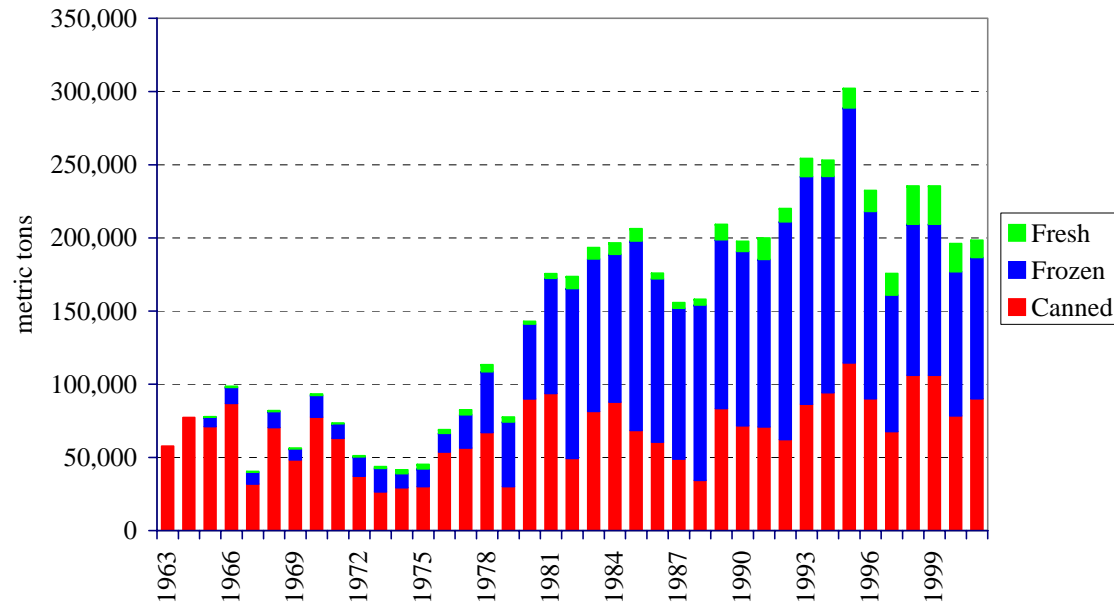
**Overview of Selected Alaska Salmon Fisheries, 2000**

Area	Gear	Gross earnings (\$millions)	Total permits	Resident permits	Resident share of permits	Share of permits fished	Average earnings per permit fished (\$ 000)	Average permit value (\$ 000)
Bristol Bay	Drift gill net	65.5	1,896	916	48%	96%	35.9	80.5
Southeast	Purse seine	28.8	416	189	45%	86%	80.8	39.3
PWS	Drift gill net	22.2	541	393	73%	97%	42.3	59.3
PWS	Purse seine	19.2	268	197	74%	49%	147.8	22.0
Chignik	Purse seine	12.3	99	75	76%	100%	124.4	200.0
Cook Inlet	Drift gill net	4.2	577	384	67%	89%	8.3	32.3
Kuskokwim	Gill net	1.2	823	815	99%	76%	1.9	6.5
Lower Yukon	Gill net	0.7	704	694	99%	80%	1.3	12.1
Other 19 fisheries		91.5	6,432	5,193	81%	62%	23.0	
Total		245.7	11,756	8,856	75%	73%	895.8	1103.1

Source: Commercial Fisheries Entry Commission, Basic Information Tables.

Alaska wild salmon are processed into four major primary products: canned salmon, frozen salmon, fresh salmon, and salmon roe. Products and markets vary for different species.

Alaska Salmon Production



Alaska's coastal communities are heavily dependent on salmon fishing and processing for jobs, income and taxes.





Alaska salmon fishing allows small-boat owners the chance to live and work in remote places of great beauty.



Alaska salmon fishermen are typically hard-working, independent-minded, and love fishing. They want their world to stay the same.



It's a known fact that if you grow up in Alaska  
you'll be stronger, healthier and better looking.  
(especially if you're a salmon)

Two young boys are smiling and holding large salmon. The boy on the left is wearing an orange hooded raincoat, and the boy on the right is wearing a yellow hooded raincoat. They are standing on a boat deck.

  
**ALASKA SEAFOOD**

*Alaska*  
**Salmon**  
Naturally a World Apart

In Alaska's pure, icy waters, salmon naturally develop firmer meat that's rich in Omega-3 oils, great tasting, and much more attractive to your customer. For easy menuing and merchandising ideas with Alaska Salmon, call: 1-800-806-2497 or visit our web site: [www.alaskaseafood.org](http://www.alaskaseafood.org).

There is no salmon farming in Alaska.  
Salmon farming is banned in Alaska.

- Salmon farming was banned in Alaska to:
  - Protect Alaska wild salmon stocks
  - Protect Alaska wild salmon against economic competition from farmed salmon



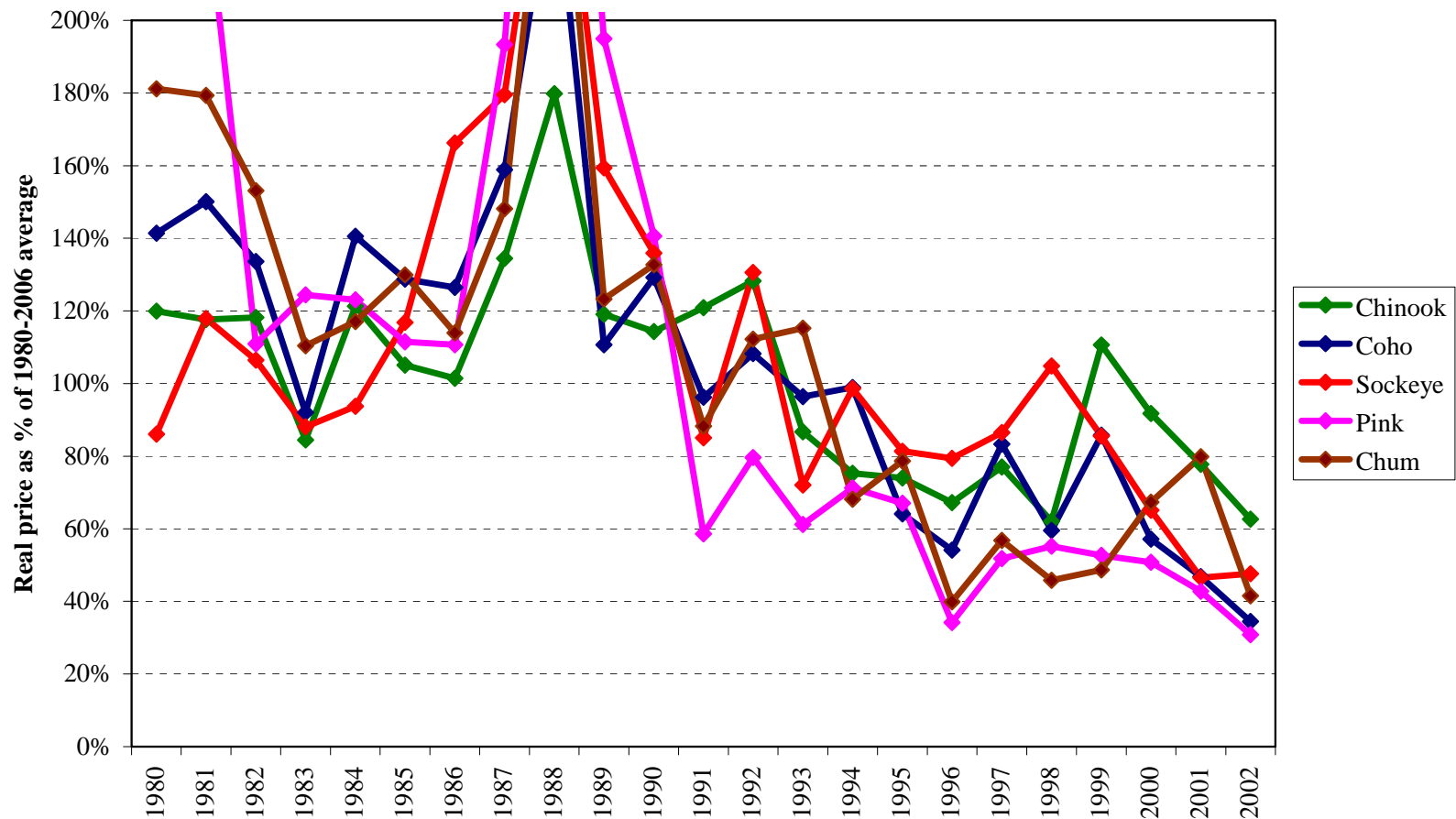
How may aquaculture affect wild fisheries?

**Ten lessons** from the  
experience of the Alaska wild salmon industry.

1. Aquaculture can have rapid and dramatic negative effects on markets for wild fisheries.

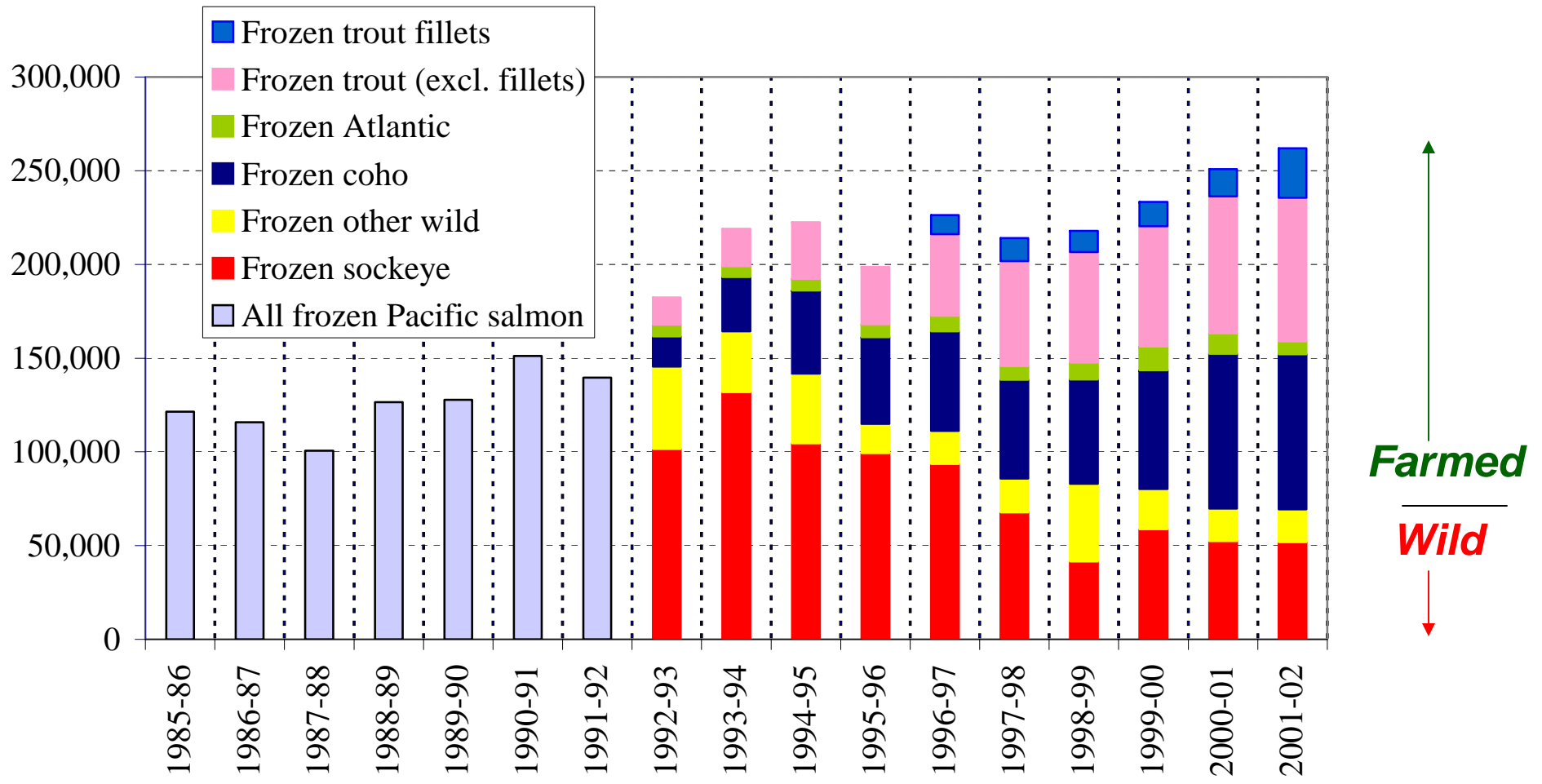
Competition from farmed salmon was the most important cause of a dramatic decline in Alaska wild salmon prices between the 1980s and 2002.

**Indexes of Real Alaska Salmon Ex-Vessel Prices, 1980-2002**

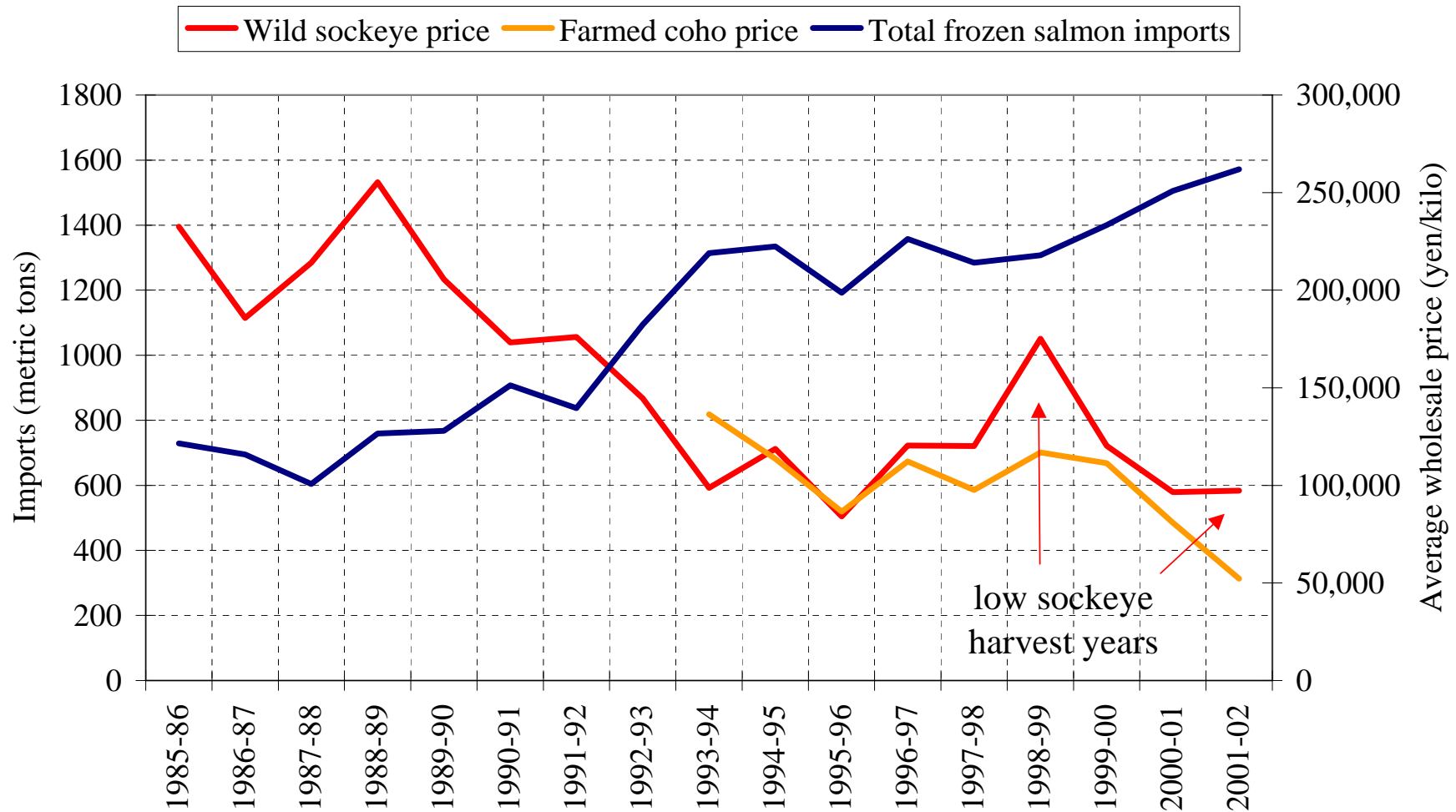


Source: ADFG. Note: 1988 price indexes peaked well above 200% for most species.

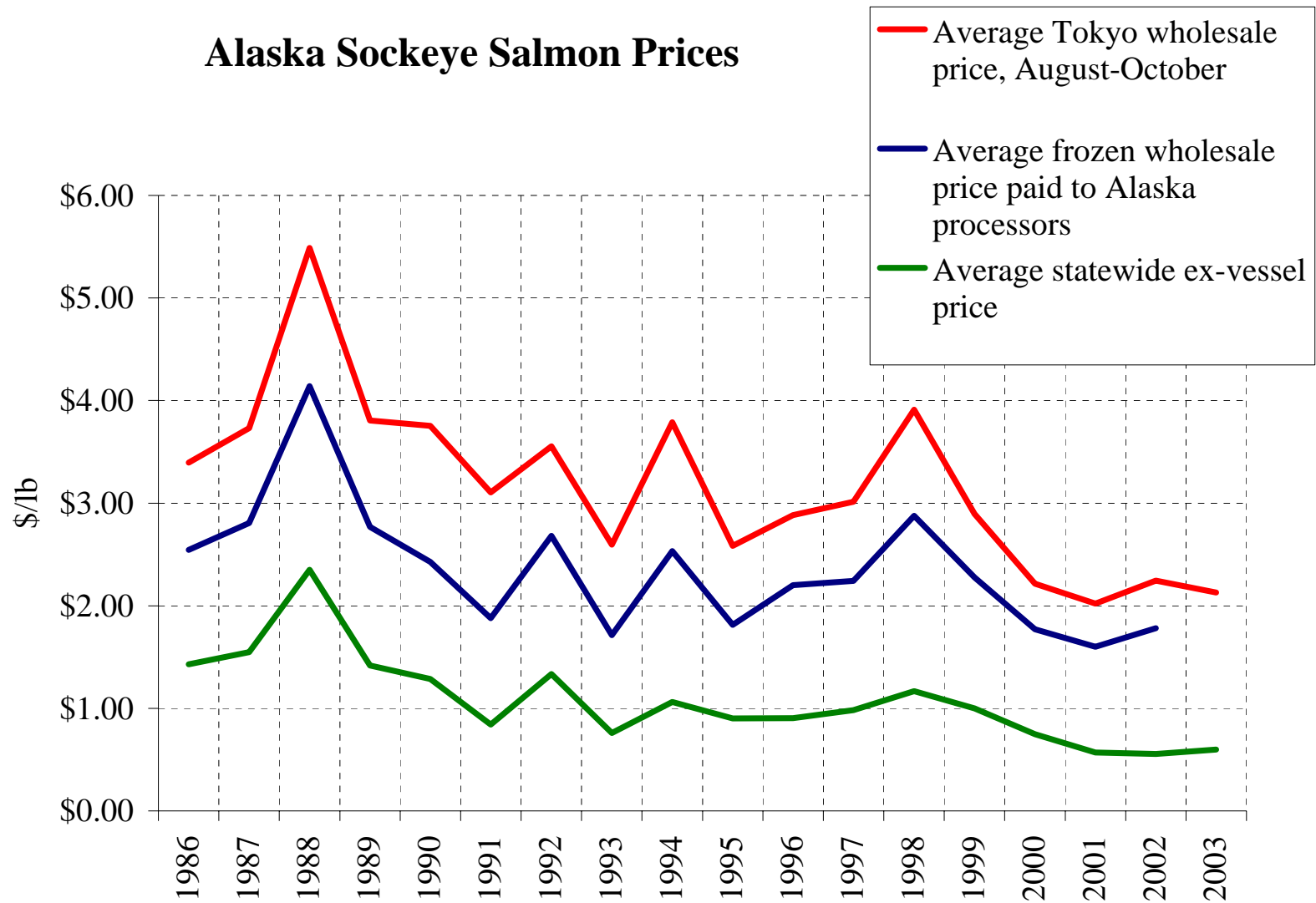
In just ten years farmed salmon replaced wild sockeye as the dominant product in the Japanese frozen salmon market.



As total supply increased, Japanese wholesale prices for both farmed salmon and sockeye salmon fell dramatically.



As Japanese wholesale prices declined, prices paid to Alaska processors and fishermen declined.





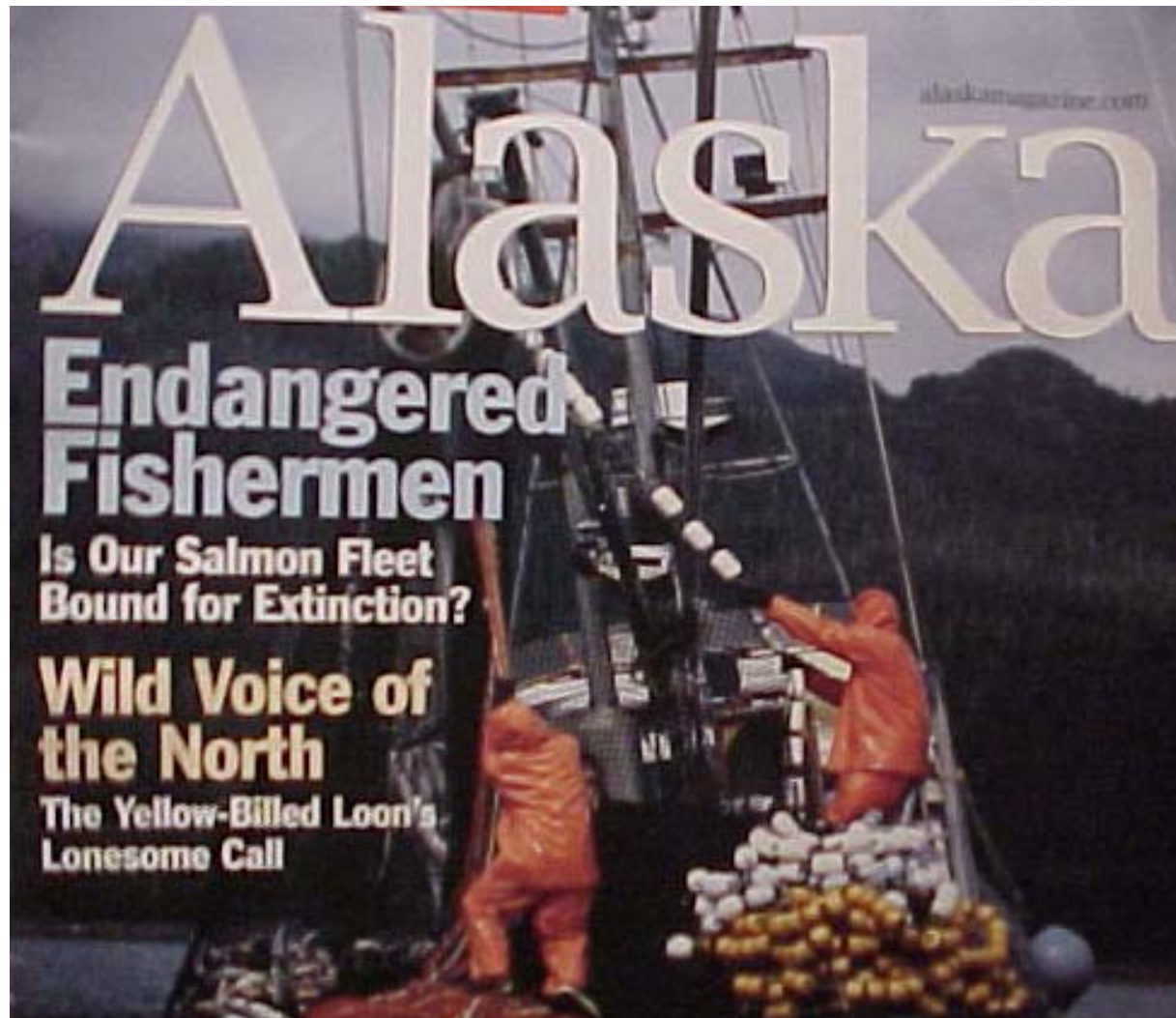
Clearly farmed salmon affected wild salmon markets.  
But farmed salmon wasn't the only factor affecting wild salmon markets!

- Large Alaska wild salmon harvests
- Increased exports of Russian wild salmon following break-up of the USSR
- Stagnation of Japanese seafood demand
- Increasing consolidation and market power in the retail and food service industries
- Changing international standards for food handling and safety
- Shift in labor-intensive seafood processing to countries with low labor costs

Farmed salmon has not been a major factor in significant changes which have occurred in markets for canned salmon and salmon roe.



2. Changes caused by competition from aquaculture may be painful and difficult for those who depend upon wild fisheries.



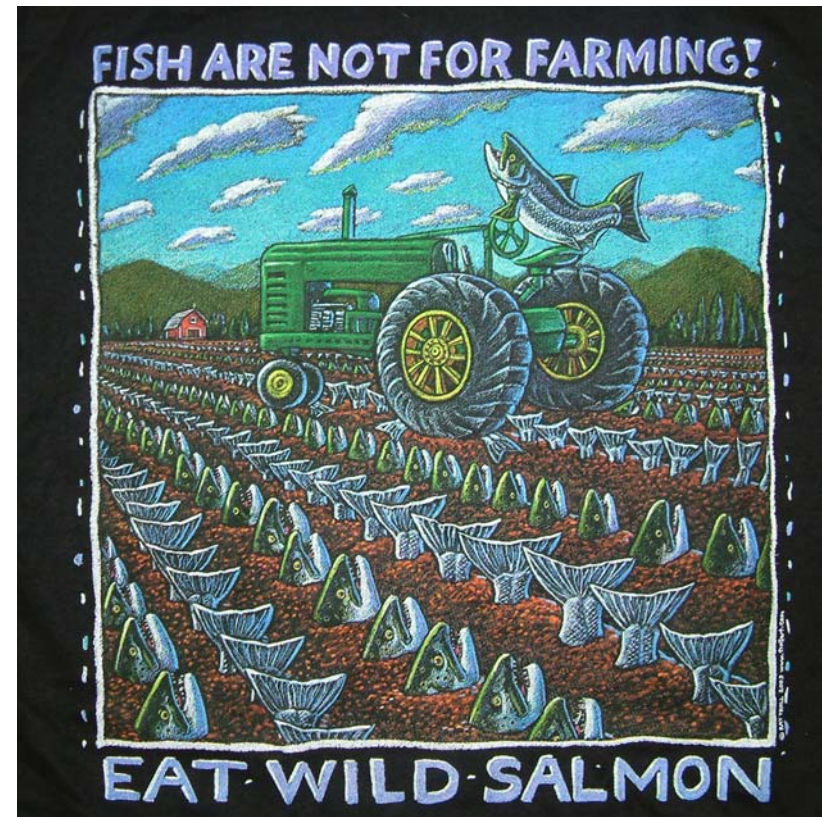
## Effects of market changes in the Alaska salmon industry

- Drastic decline in income
- Decline in value of boats and permits
- Decline in fishery participation
- Consolidation in the processing industry
- Declining tax base in rural communities
- Declining populations in fishing communities
- Social stresses: alcohol abuse and family abuse
- Declining political influence of the salmon industry
- Pressures for reallocation from commercial fisheries to other user groups

Most of the world doesn't know or care about these problems.



Alaska fishermen blame salmon farming for their problems.



*T-shirt by Alaska artist Ray Troll*

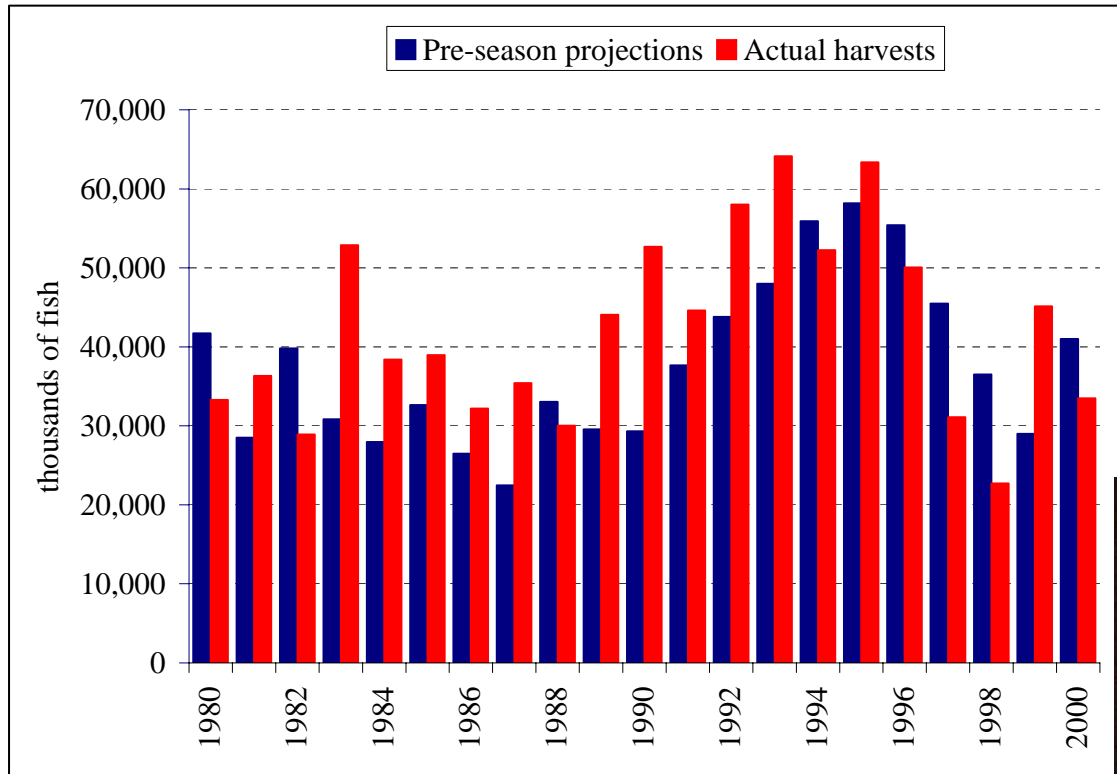
3. In an increasingly globalized economy, the market effects of aquaculture on wild fisheries occur regardless of where the aquaculture is happening.

- Alaska wild salmon are sold in global markets.
- The decline in Alaska sockeye salmon prices was caused by farmed salmon production in a foreign country for export to another foreign country (Japanese imports of farmed salmon and trout from Chile and Norway).
- Banning fish farming in Alaska didn't keep it from happening.
- Banning U.S. farmed salmon imports wouldn't have kept it from happening.



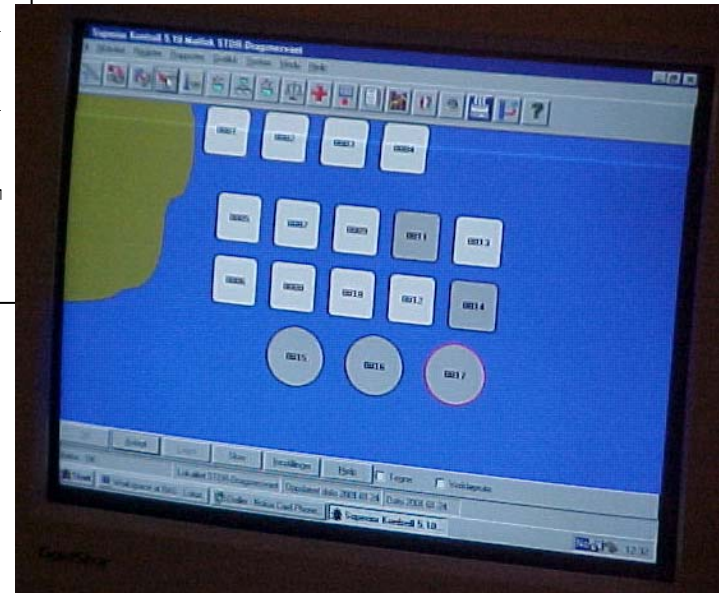
4. Wild fisheries may face significant inherent challenges in competing with aquaculture. These challenges derive from the fact that aquaculture producers have much greater control over production.

Inconsistent and unpredictable supply makes it much more difficult for wild salmon producers than for farmed salmon producers to meet buyers' supply needs and to plan for marketing.



*Actual Alaska sockeye salmon harvests typically differ from pre-season projections by 30%.*

*This computer at a Norwegian salmon farm can tell the producer exactly how many fish of what size are in each pen (and in the pens of all the farms owned by this company on three continents)*

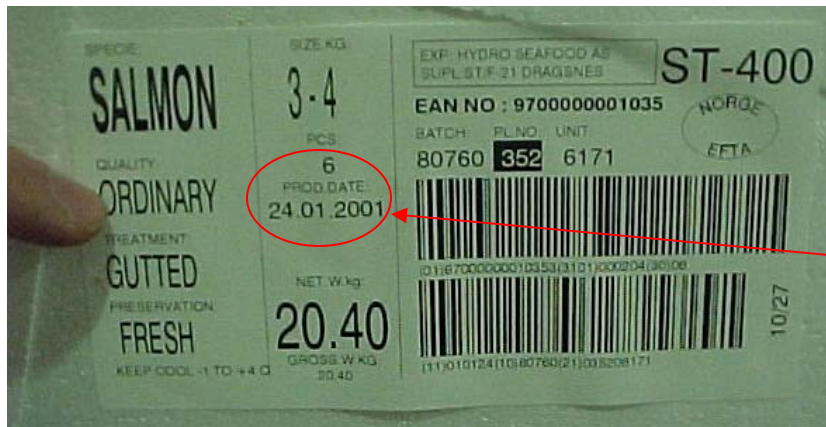


The seasonality of wild salmon fisheries increases production costs relative to farmed salmon, and makes it relatively more difficult to market wild salmon.



← The fact that many Alaska fishing boats and processing plants are idle for much of the year is a huge cost disadvantage.

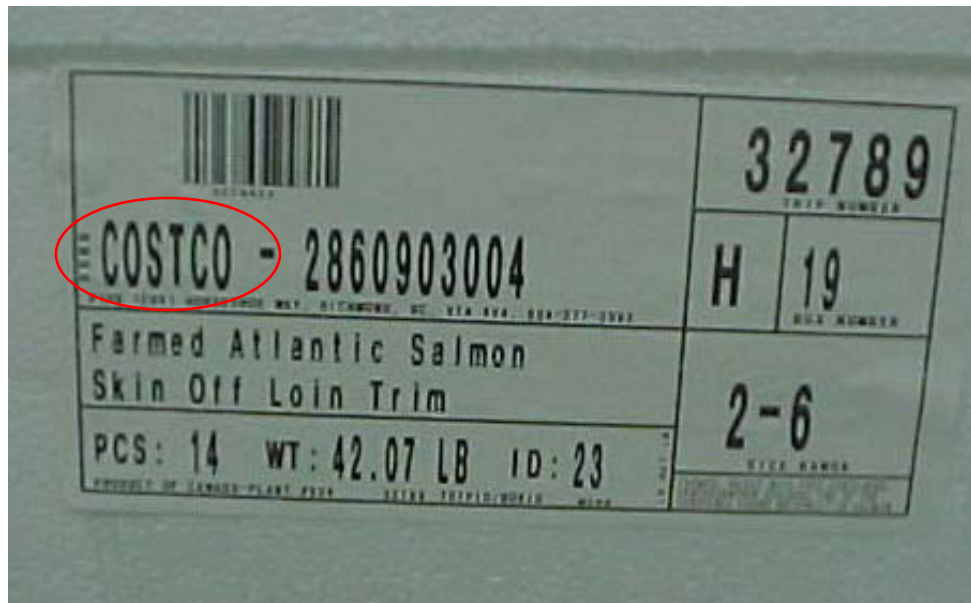
Because it processes farmed salmon year round, this relatively small British → Columbia facility processes as much salmon as the largest Alaska facilities.



→ Norwegian salmon processed in winter



*Very large harvests in short time periods makes canning the only practical option in some wild salmon fisheries.*



*Because it can choose when to process fish, this BC farmed salmon processor doesn't process salmon until it already has a buyer. The fish are processed to that buyer's specifications.*



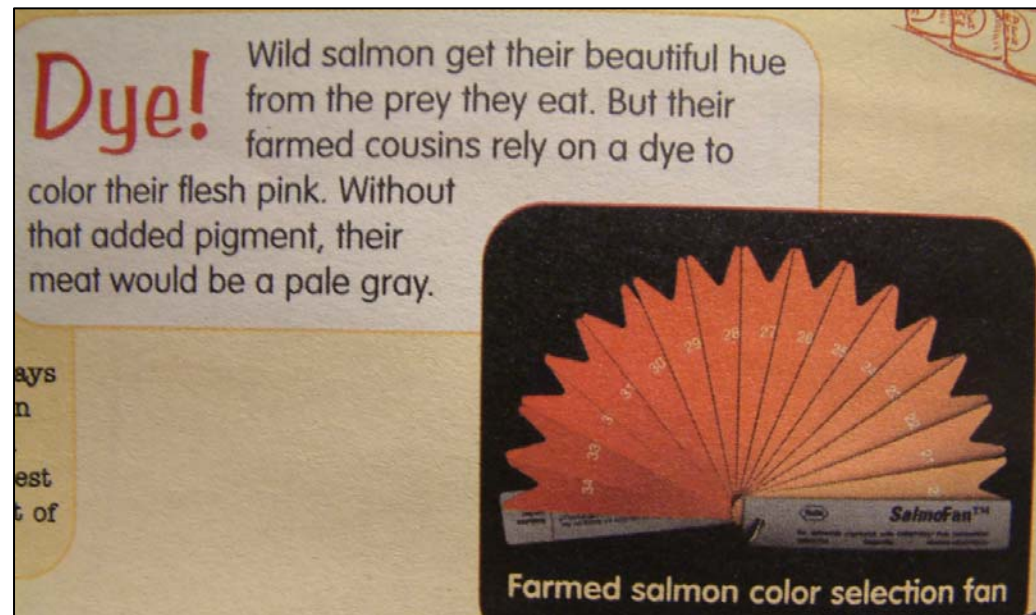
Wide variation in sizes and quality increases costs of processing and marketing wild salmon.

<u>BRITE KINGS</u> H/OFF -10 MRK 10-15 LRK 15-18 LRK 18-25 XLRK 25+ XLRK	<u>BLUSH KINGS</u> H/OFF -10 MRK 10-18 LRK 18+ XLRK	<u>DARK RED &amp; WHITE KINGS</u> H/OFF +10 LRK -10 MRK			
		<u>ALL STD KINGS</u> NO DARK STD -10 MRK +10 LRK			
<u>BRITE WHITE KINGS</u> H/OFF -10 MRK 10-18 LRK +18 XLRK	<u>BLUSH WHITE</u> H/OFF KINGS -10 MRK 10-18 LRK +18 XLRK	<u>COMO</u> H/OFF 2-4 4-6 6-9 9-12 +12	<u>CRAB</u> H/OFF 2-4 4-6 6-9 9+ <small>DATE TO YOUNG</small>	<u>SOCKET</u> H/OFF 2-4 4-6 6-9 9+	<u>ALL STD.</u> <u>COMO</u> <del>COMO</del> <u>SOCKET</u> SAME SIZE

*Grades at a southeast Alaska processing plant*

POPULAR / GREEN /ALASKAN PERSPECTIVE:  
Farmed salmon is an inferior product.

Chefs around the country rate wild salmon far superior to farmed. "To be perfectly honest, it [farmed salmon] is crap," says Executive Chef Daniel Long of Bon



Salmon farming critics miss the real lesson of the *SalmoFan*:



The real lesson is that aquaculture responds to market demand in ways that wild fisheries can't even imagine.

## AN ECONOMIC PERSPECTIVE:

Farmed salmon meets many buyers' needs better than wild salmon.

Buyers care about a lot more than what food tastes like.

They also care about:

- What it costs
- Whether it's available when they need it in the volumes they need it in
- What product forms it's available in
- Whether its been handled well



5. Competition with aquaculture exposes not only inherent but also “self-inflicted” challenges in wild fisheries.

*Significant quality problems in many fisheries resulting from practices at many different stages of fishing, tendering and processing*



*Bruises in a Yukon River chum salmon fillet*

## *Significant quality problems . . .*

*Bruising as fish are caught in and removed from gillnets*



*Fishermen focused on catching fish fast rather than handling them well*





*Lack of careful handling during  
tendering, and long delivery times  
between when fish are caught and  
when they are processed*



*Photographs by Bart Eaton*

*Far more boats than are needed to harvest the fish in some fisheries—leading to a “race for fish” which adds to costs and hampers quality*



*Photographs by Bart Eaton*



6. Economic pressures caused by aquaculture may contribute to changes to which make wild fisheries more economically viable.

- In the Alaska salmon industry, as fishermen and processors exited the industry costs fell and efficiency increased.
- There have been significant improvements in quality in some fisheries
- Marketing efforts have expanded dramatically.
- There have been political pressures for fishery management changes and restructuring.
- These changes are analogous to those which occur in a monopoly industry when it is exposed to competition.

7. Aquaculture benefits consumers by lowering prices, expanding supply, developing new products, and improving quality of both farmed and wild fish.

- Since the development of salmon farming, both farmed and wild salmon have become:
  - Cheaper
  - Available much more consistently over the year
  - Available in far more stores and restaurants
  - Available over a far larger geographic region
  - Available in more product forms
  - Higher quality
- These benefits to consumers are analogous to those consumers derive when a monopoly is exposed to competition.

Salmon farmers have expanded demand—and benefitted consumers—by developing a wide range of attractive and convenient new products.





Salmon farming has made more salmon and more types of salmon products available to consumers, for a wider range of prices.

Salmon fillet products for sale at Whole Foods, Wisconsin Avenue,  
Washington DC, March 5, 2008

## FARMED

- Atlantic Salmon Fillets, “Farm raised, color added,” \$12.99/lb
- Atlantic Salmon Steaks, “Farm raised, color added,” \$11.99/lb

## WILD

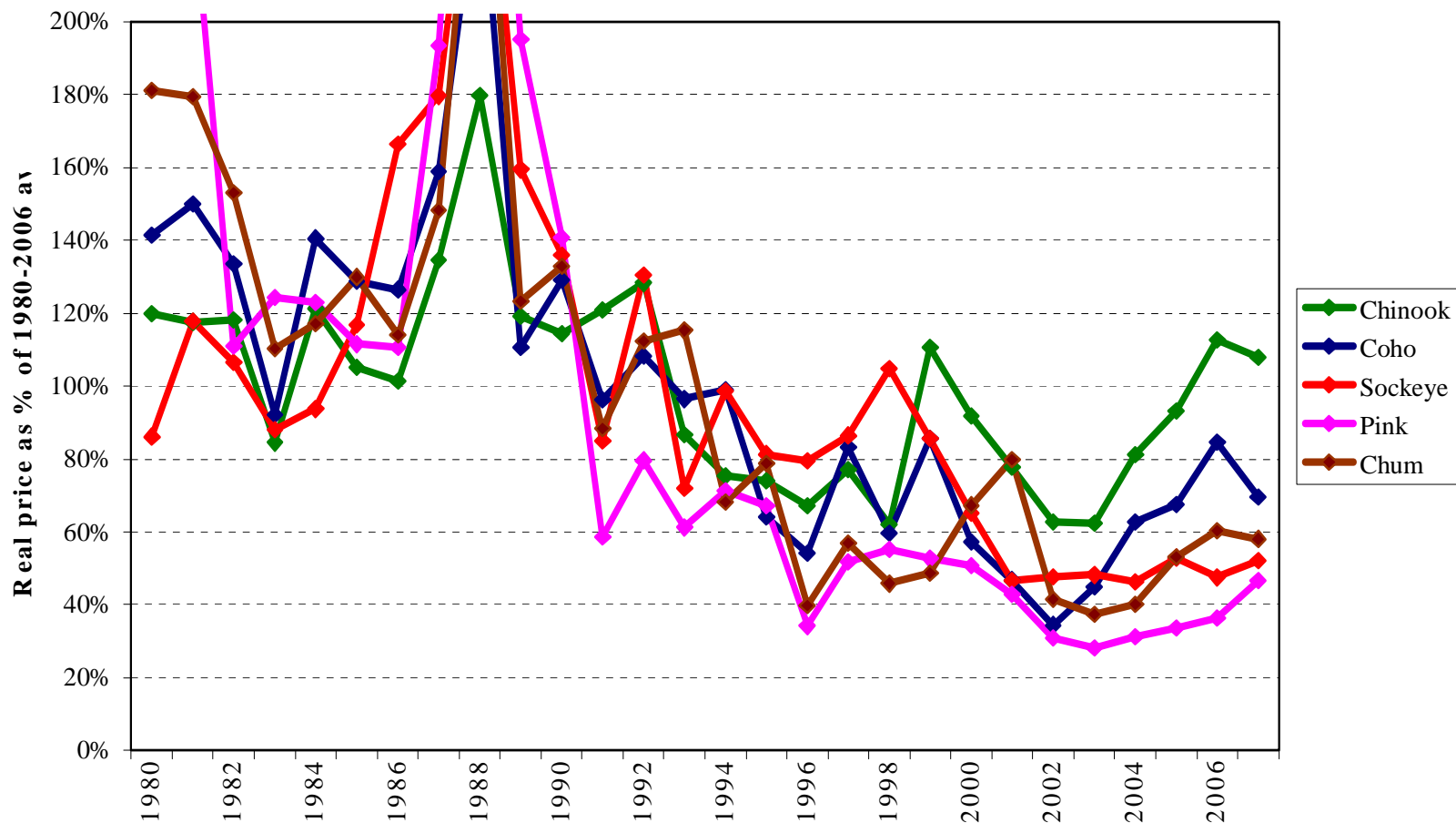
- Coho Salmon Fillets, “Wild caught, previously frozen,” \$14.99/lb
- Alaska Sockeye Salmon Fillets, “Wild caught, previously frozen,” \$13.99/lb

8. Over the long term, aquaculture may benefit markets for wild fisheries by expanding markets and creating new market niches for wild fisheries.

- Salmon farming has made salmon much more widely available—in more countries and more stores, throughout the year
- Salmon farming has created new fish consumers
- The salmon farming industry has developed new products.
- Because of greatly expanded demand, farmed salmon prices have been strong for the past few years, despite greatly expanded supply.
- By creating new markets, salmon farming has created more potential consumers of wild salmon.
- The growth of salmon farming is creating growing niche market opportunities for high-quality wild salmon.

Real ex-vessel prices for most Alaska salmon species have increased sharply since 2002.

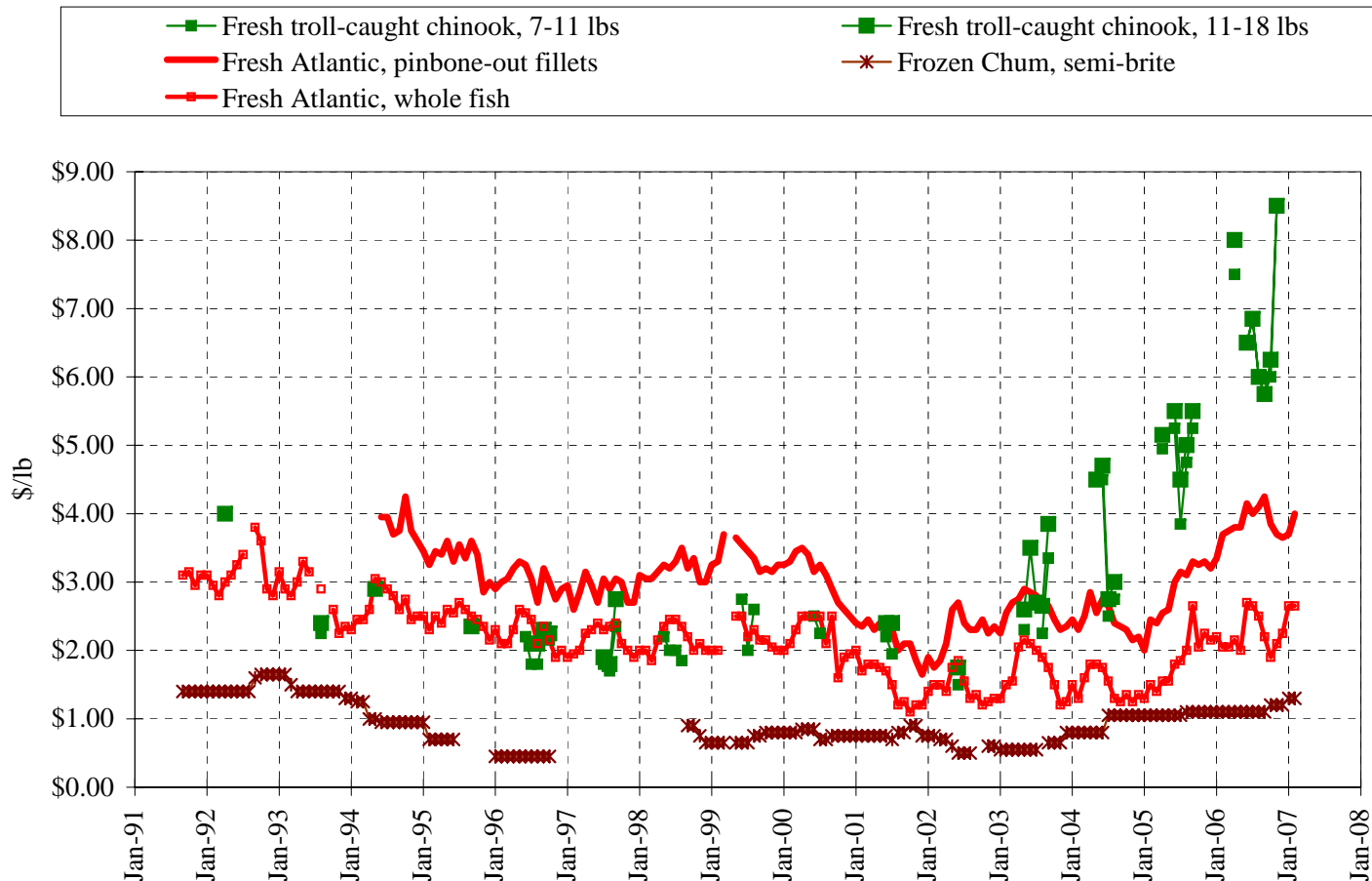
**Indexes of Real Alaska Salmon Ex-Vessel Prices, 1980-2007**



Source: ADFG. Note: 1988 price indexes peaked well above 200% for most species.

The increase in wild salmon prices derives from an increase in total demand—which has strengthened prices for both wild and farmed salmon—as well as a growing price differential for high-quality wild salmon such as troll-caught chinook.

### U.S. Wholesale Prices for Selected Wild and Farmed Salmon Products



Source: Urner Barry Publications, Inc., Seafood Price Current. Prices are low list prices for Chilean 2-3 lb fillets, FOB Miami; 6-8 lb Atlantics, FOB Northeast; and 7-11 lb and 11-18 lb troll-caught head-on chinook salmon.

Prices have risen sharply in high-quality wild salmon fisheries such as the Copper River fishery and Southeast Alaska troll fisheries.

## COPPER RIVER SALMON ARE BACK

May 2004

# Commercial fishermen net record prices for kings and reds

*Consumers also can expect to pay more for flavorful fish*

By T.C. MITCHELL  
Anchorage Daily News

Salmon eaters, brace yourselves. After 12 hours of fishing Monday, the Copper River Delta commercial fleet was rewarded with the best king and red salmon prices they've ever seen.

Fishermen got \$6.25 a pound for kings they delivered to tenders, and a dime more for fish delivered straight to the processors, said Mark Irving, a Cordova fisherman who participated in the season opener. He said the reds brought \$4.25.

Last year's prices at this time

■ **SALMON:** 12-page section devoted to Alaskans' favorite fish, including marketing, dining, art and the salmon's cycle of life.

**Life & Salmon, D-1**



were reported at \$2.85 per pound for reds and \$5 for kings. What fishermen get for their fish helps determine what people pay in markets and restaurants.

Bill Gilbert, manager of NorQuest Seafoods, a salmon buyer in Cordova, said the opening prices this year are historic — and reflect an improving Lower 48 economy.

"They've never been this high," he said.

Persistent promotion of Copper River salmon in recent years is pay-



ERIK HILL / Anchorage Daily News

Levi Adams positions a fresh Copper River king salmon fillet in the display case at New Sagaya.

See Back Page, **COPPER RIVER**



9. Aquaculture may have both direct and indirect effects on wild fishery resources, which may be either positive or negative.

- Farmed salmon has not had any direct effects on Alaska wild salmon resources—because there is no salmon farming in Alaska.
- Lower salmon prices—caused by farmed salmon--has only slightly reduced fishing pressure on Alaska wild salmon (a potential positive effect)
- Lower salmon prices have reduced incentives to protect the environment on which Alaska salmon depend (a potential negative effect)
  - Reduced funding for fisheries management.
  - Proposed reduction in water quality standards for mining operations
  - New proposals for oil drilling in Bristol Bay
  - New proposals for large-scale gold mining in Bristol Bay drainage

10. The experience of Alaska wild salmon suggests that anyone interested in wild fisheries should pay close attention to what is happening in aquaculture. No wild fishery market—especially for higher valued species—should be taken for granted.

- Aquaculture will continue to grow rapidly because it can meet market demands for predictable, year-round and growing supply of high-quality seafood.
- The challenges to wild fisheries posed by aquaculture will increase over time—regardless of what policies the United States adopts towards aquaculture.

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## About this presentation

This presentation is adapted from a presentation which I gave at the Global Trade Conference on Aquaculture, Qingdao, China, May 31, 2007.